Has Decoupling Worked? New Empirical Evidence and Its Implications (Michael J. Roberts, USDA-Economic Research Service, Presiding)

Another Look at Decoupling: Additional Evidence on the Production Effects of Direct Payments

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An important shift in U.S. agricultural policy occurred with the 1996 Federal Agriculture Improvement and Reform (FAIR) Act. Although the actual intent and effects of the Act remain a topic of debate, many observers believed that the 1996 legislation signaled a transition toward a new policy environment characterized by diminished government involvement in agricultural markets. Perhaps the biggest change in policy under the Act pertained to the use of fixed, decoupled payments (called "production flexibility contract" or "Agricultural Market Transition Act" [AMTA] payments).

Under the terms of the FAIR Act, AMTA payments were intended to decline each year until the FAIR Act expired in 2002. However, periods of low prices and localized yield shortfalls during the late 1990s led Congress to pass supplemental, ad hoc payments to farmers. These payments, known as "Market Loss Assistance," were also decoupled since they were paid on the basis of historical base acreage and thus carried no current production requirements. These payments were, however, tied to market prices in that they were a response to poor market conditions.

Any perceptions that the fixed, direct payments were transitory were put to rest when Congress passed the 2002 Food Security and Rural Improvement Act (FSRIA). The new farm legislation provided generous increases in support and extended the fixed, direct payments for another six years. In addition, producers were given the opportunity to update their base acreage and yields, which determine the payments.[1] The ad hoc market loss assistance payments were also formally brought into farm legislation in the form of "Counter-Cyclical Payments" (CCP).

The extent to which the fixed, direct payments are actually decoupled from the market has been a topic of considerable debate. Critics of the programs argue that even though such payments are not directly tied to production requirements or market conditions, they may still have important effects on production. Two avenues for such effects have been identified in the relatively sparse literature that has addressed this issue. The first involves imperfect capital markets. If farmers are credit-constrained and would prefer to expand production but are unable to obtain the financing to do so, the receipt of direct payments may allow them to expand or otherwise alter production. A second avenue for production effects involves risk preferences. If agents' risk preferences are such that additions to wealth change their risk aversion (e.g., decreasing absolute or relative risk aversion), they may choose to take on more risk

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[1] Under the 2002 Farm Bill, farmers were given the option to bring soybeans into the program as a base crop. Farmers could update program yields for counter-cyclical payments, though direct payment yields remained fixed at 1996 levels (i.e., the 1981–1985 average). Soybean payment yields were set at the 1981–1985 levels for direct payment purposes.

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in response to the payments. This may result in changes in production through additional acreage or changes in the use of other farm inputs.

The base updating provisions of the 2002 legislation also brought about debate over the production neutrality of direct payments. The extent to which farmers anticipated the updating provisions may have affected their production decisions prior to the 2002 Act. Likewise, agents may anticipate future updating opportunities and thus choose from among their production options in anticipation of such future opportunities. The production neutrality of fixed, direct payments was an important issue in a recent WTO debate over the U.S. cotton program. Brazil charged that the U.S. cotton programs had caused serious prejudice (damage to competitors' interests) in world markets and that two of the programs—Step 2 and GSM (General Sales Manager export credit guarantees)—were prohibited export subsidies. As a part of the debate, the WTO panel examined all U.S. programs. The panel concluded that direct payments were not "green box" because of a seemingly minor restriction that the base acreage on which the direct payments were based could be used for anything (including set-aside) other than fruits and vegetables production. It is also relevant to note, however, that the WTO panel concluded that the direct payment programs did not affect production and hence did not cause serious prejudice.[2]

Relatively little research has been directed at this policy issue. Chau and de Gorter argued that AMTA payments may allow producers to cover fixed costs and thus may allow marginal farmers that would otherwise be forced to shut down to remain in production. In a similar vein, Roe, Somwaru, and Diao pointed out that decoupled payments may improve producers' access to credit by raising wealth directly and through increases in land values. They also noted that expectations about future farm programs may tie program benefits to production, though they conclude that the distortionary effects of decoupled programs are likely to be modest. A recent USDA study (Burfisher and Hopkins) concluded that decoupled payments had no effect on production and, further suggested that coupled market loan payments had a very modest effect on acreage. A recent study by Goodwin and Mishra pursued an empirical examination of the extent to which the acreage decisions of a set of Corn Belt farms during the FAIR Act were affected by direct payment receipts. They concluded that the payments had very modest, though statistically significant effects on acreage decisions. However, they noted that their results likely contained a positive bias in the implied effect of direct payments. This bias arose because the farms in their sample were not observed over time and thus did not allow conditioning on past events.

The objective of this investigation is to consider an extension to the earlier research of Goodwin and Mishra that explicitly addresses the bias identified in their analysis. In particular, we use more recent farm-level data for the years 2002 and 2003 to examine acreage decisions of Corn Belt producers. In contrast to the earlier work of Goodwin and Mishra, we are able to measure historical patterns of production that may allow us to condition out any biases that may underlie our results. We also consider responses to a number of survey questions regarding factors affecting acreage decisions and the disposition of funds received in the form of direct payments.

Modeling Framework and Econometric Methods

Conceptual Framework

Agents will act to maximize the expected utility of wealth, including changes brought about by discounted future expected profits. In each period, wealth is given by initial wealth, plus profits derived from production, direct government payments, and nonfarm activities. The agent's problem can thus be characterized as maximizing the expected value of:

$$V_t = \sum_{t=0}^{T} U\left\{\delta^t\left(\sum_i P_{it}Q_{it} \times (A_{it}, X_{it}, A_{it-j}, \epsilon_t) - w'X - C(A_{it-1}) + G_t + PS(P_{it}) + W_{t-1}\right)\right\} \tag{1}$$

where W_t is wealth, P_{it} is the price received for output i, $Q(\cdot)$ is output of product i, which is assumed to be a function of lagged or historical acreage (A_{t-j}, representing rotational issues or program benefits tied to historical production), acreage, and an exogenous shock, given by ϵ_t, X_t represents a vector of variable

[2] We are grateful to Joe Glauber for carefully explaining the finer points of the WTO panel's findings.

inputs, purchased at price w_t, and $C(\cdot)$ represents fixed costs, which also are influenced by lagged acreage. Government policies affect the producer's problem in several ways. First, prices received (P_{it}) may reflect support mechanisms such as loan deficiency payments. Second, payments based upon market conditions, such as counter-cyclical payments, and thus expectations regarding such payments will play a key role in production decisions. Such payments are represented by $PS(P_{it})$, which represents the fact that such payments may be conditioned on market prices. Finally, direct decoupled payments G_t will be important for their effects on wealth.

A number of restrictions are relevant to the producer's problem, including capacity constraints and those constraints describing the availability and cost of borrowed capital. If capital markets are perfect, wealth can be adjusted to accommodate situations where revenues are not sufficient to cover costs. However, borrowers may face credit constraints, perhaps determined by their credit worthiness. In such cases, decoupled payments may indeed be relevant to production. Agents select acreage and other inputs to maximize the expected value of the utility function. This yields reduced form acreage equations of the form:

$$(2) \qquad A_t = f(A_{t-j}, P_t, w_t, G_t, PS_t, W_{t-1}).$$

Output prices and payments based upon market conditions at harvest (PS_t) are unknown at the time planting decisions are made and thus actions will reflect agents' expectation of the harvest-time values of these variables. Thus, an estimable, reduced-form acreage response equation will assume the form:

$$(3) \qquad A_t = f\left(A_{t-j}, P_t^*, w_t, G_t, PS_t^*, W_{t-1}\right)$$

where asterisks correspond to expected harvest-time values, conditional on information available to agents at planting. In cases where an agent's risk preferences are influenced by their level of wealth (such as Constant Relative Risk Aversion [CRRA] or Decreasing Absolute Risk Aversion [DARA]), their production decisions may be influenced by their level of wealth. In this way, decoupled payments (G_t) as well as initial levels of wealth will be important.

Modeling Issues

Our empirical analysis consists of three separate components. In the first segment of our analysis, we evaluate producers' revelations regarding the factors that influence their acreage decisions. The second segment of our analysis evaluates producers' reported allocations of fixed direct payments within the farm operation and farm household. We consider a censored regression model of the allocation of direct payment receipts between farm and nonfarm uses. In the final part of our analysis, we present an updated version (using many of the same variables) of the acreage-response equations evaluated by Goodwin and Mishra.

The analysis is conducted using individual farm data collected under the Agricultural Resource Management Survey (ARMS) project by the National Agricultural Statistics Service of the USDA. We focus on data taken from two years of the NASS survey—2002 and 2003. These years are representative of the new policy environment under the 2002 FSRIA legislation. As we note above, the ARMS data have a limitation that often inhibits empirical analysis—the lack of repeated sampling on individual farms. This implies an important reliance on cross-sectional variability and prevents one from conditioning observed events on the preceding year's experience or on fixed farm effects. However, for the two years evaluated in this analysis, the ARMS survey collected information about producers' base acreages under the 1996 FAIR Act. This base was established mainly on the basis of production patterns during the 1980s.[3]

In addition to collecting information regarding acreage decisions and base acreages, the 2003 ARMS survey included several questions that directly address farmers' perceptions about the factors that influence their acreage decisions and the disposition of direct payments within their farm and farm household. Farm operators were queried about the factors that underlie their acreage decisions. They were also asked to identify the allocation of funds received as direct payments within their farm and household. For those farms that did not actually receive direct payments in 2003, they were asked to identify the allocation of a hypothetical $10,000 direct payment.

Unpublished data on county loan rates were obtained from the Farm Service Agency (FSA) of the USDA. Chicago Board of Trade (CBOT) futures market prices for corn, soybeans, and wheat were taken from the Bridge database. An expected price for each county

[3] Note that no distinction is made in the survey regarding whether base acreage is rented or owned. To the extent that landlords are able to extract program benefits through higher rents, differences in the effect of rented versus owned base acreage may exist.

was taken by calculating a state average basis for each state using season average prices collected from the USDA's National Agricultural Statistics Service (USDA-NASS) and then adjusting the planting time price for the harvest time contract for the annual, state average basis charge. This yielded a state average expected harvest-time market price.[4] The greater of the expected cash price or the county loan rate was taken to represent the expected commodity price. Unpublished county-level data describing farm program payment receipts in each farm program category were obtained from the USDA. These data were used to measure county-level aggregates of ad hoc payments that were provided to farms during the 1994–2001 period. These were placed on a per-acre basis using total farm acreage in each county, taken from the 1997 *Agricultural Census*.

In the second segment of our analysis directed at acreage response modeling, we focus on mainstream, commercial farms. Thus, we eliminated any farm from the ARMS survey that was defined (using the Economic Research Service's [ERS] farm typology index) as a limited resource, lifestyle, or retirement farm. In addition, any farm with less than 50 acres of total land was dropped from our sample. In light of the considerable heterogeneity of crop types, production practices, and policy types across different regions, it is important that a relatively homogeneous group of farms be evaluated. Thus, our analysis of acreage patterns is focused on the Corn Belt region of the United States—which we define using the USDA-ERS farm resource region designation of the "Heartland."[5] Our focus is on acreage of corn, soybeans, and wheat—overwhelmingly the primary crops in this region.

We have emphasized the important role of risk preferences as a factor determining planted acreage of crops and the potential effects of decoupled payments. The measurement of risk preferences in empirical models is difficult, since preferences are not directly observable and available survey data generally do not collect information about such preferences. We represent risk preferences in our empirical models by using a proxy variable, constructed as the ratio of total expenditures on insurance over total farm expenses. We hypothesize that more risk-averse farms will tend to devote more of their total production expenditures to insurance. We are able to directly measure a farm's wealth. Our measure of wealth is given by total farm assets less total farm debts. In order to prevent double counting of AMTA payments, we subtract AMTA payment receipts from total wealth. All financial values are converted to real terms by dividing by the consumer price index.

A number of important econometric issues underlie our empirical analysis. An important characteristic of the ARMS data relates to the stratified nature of the sampling used to collect the data. Two estimation approaches have been suggested for problems such as this involving stratification. The simplest involves a jacknife procedure, where the estimation data are split into a fixed number of sub-samples. An alternative approach involves repeated sampling from the estimation data in a bootstrapping scheme. We use a probability-weighted sampling scheme whereby the likelihood of being selected in any given replication is proportional to the number of observations in the population represented by each individual ARMS observation. This approach was applied by Goodwin and Mishra in their earlier analysis.[6]

An important econometric problem also involves the fact that a censoring issue underlies our empirical acreage models. Not every farm produces every crop in each year. To address this censoring issue, we utilize the recently introduced procedures for modeling censored systems of equations of Shonkwiler and Yen.

Empirical Results

Definitions and summary statistics for the variables used in our analysis are presented in table 1. Our analysis of farm-level acreage allocations within the Corn Belt was based upon 1,609 farms. Our analysis of farmers' beliefs regarding the relevance of factors underlying their acreage decisions and the allocation of fixed payments within their farm household was based upon a nationwide survey comprised about 4,125 observations.[7]

[4] We utilized the average daily close prices in February for December corn and November soybean futures and the average daily price in September for the July wheat futures on the CBOT.

[5] This region comprised a homogeneous grouping of counties in Illinois, Indiana, Iowa, Kentucky, Minnesota, Missouri, Nebraska, Ohio, and South Dakota.

[6] We utilize 2,500 replications in the applications that follow.

[7] The exact number of observations varied slightly due to incomplete survey responses.

Table 1. Variable Definitions and Summary Statistics

Variable	Definition	Mean	Standard Deviation
Corn acres	Corn acreage	375.7601	561.9626
Soybean acres	Soybean acreage	419.7011	586.4413
Wheat acres	Wheat acreage	39.5873	129.2537
Corn price	Max (basis-adjusted futures price, county loan rate)	2.5173	0.1269
Soybean price	Max (basis-adjusted futures price, county loan rate)	5.1698	0.1446
Wheat price	Max (basis-adjusted futures price, county loan rate)	3.1807	0.1674
Farm size	Total farm size (acres)	1,047.4500	1,326.5900
Ad hoc payments	Average disaster payments 1994–2001 ($/acre)	8.3345	2.6314
Direct payments/acre	Direct payments ($/acre)	10.8136	11.5559
Wealth	Farm assets—farm debt	10.8569	17.1792
Livestock	Ratio of livestock sales to total sales	0.2581	0.3730
Debts/assets	Debt to asset ratio	0.1723	0.5196
Insurance	Ratio of insurance expenses to total expenses	0.0505	0.0483
D_{2002}	1 if farm observed in 2002, 0 in 2003	0.2312	0.4217
Base_{FAIR}	Sum of corn and wheat base acres under FAIR	203.2206	488.5533
Fuel price	State average farm wage rate ($/hr.)	1.0804	0.0849
Fertilizer price	State average nitrogen price ($/lb.)	0.2179	0.0316
Wage	State average gasoline price ($/gallon)	9.3213	0.5704
Farm use	Proportion of direct payments used on farm	80.6051	29.9326
Crop sales	Ratio of crop sales to total sales	0.3945	0.3897
Age	Operator age	54.2214	12.7455
Sole proprietor	1 if farm is sole proprietorship, 0 otherwise	0.7582	0.4282
Retiring	1 if operator plans to retire in next 5 years, 0 otherwise	0.1809	0.3850
Off-farm work	Weeks worked off-farm in preceding year	12.3223	20.9068
Total household income	Total household income	11.6477	48.0502
Household net wealth	Total household net worth (hundred thousand)	13.9554	26.0631

Factors Important to Acreage Decisions

Farmers were asked to rate the importance of ten different factors in determining their acreage decisions using a five-point Likert scale ranging from "Not at All Important" to "Very Important." Summary statistics (table 2) describe the frequencies and percentages of responses falling into each of the five categories. Note that we present both unweighted and weighted averages, where the latter are weighted using the population weights provided in the ARMS data. Only the weighted estimates allow inferences to be drawn about the population as a whole.

Farmers rank the cost of inputs as the most important factor influencing their production decisions, with over 54% of the sample indicating that input costs are important or very important as a determinant of crop acreages. The results also indicate that crop rotation issues and the expected commodity price are also important factors, with 44.2% and 40.6%, respectively, indicating that these are important or very important factors. It is also interesting to note that substantial proportions of the sample rated the same factors as unimportant or not at all important. In particular, 35.5%, 25.5%, and 31.6%, respectively, rated crop rotation, input cost, and expected price as unimportant. These differences in opinions likely reflect crop and regional differences that exist in the pooled sample. Some crops are much more dependent upon rotation patterns than others. Likewise, input requirements differ across different commodities, making input costs much more important to some growers than to others.

A substantial majority of the producers indicated that landlord preferences were unimportant or not at all important to their acreage decisions. In a result that is somewhat surprising, a majority (54.6%) of the producers indicate that loan rates are unimportant or not at all important to their acreage decisions. In light of the fact that commodity prices are perceived to be very important for many growers, this

Table 2. Relative Importance of Factors in Producers' Acreage Decisions

Importance Ranking	*n*	Unweighted Percentage	Weighted Percentage
Crop Rotations			
Very important	1,394	32.99	22.76
Important	1,066	25.23	17.86
Neither important or unimportant	705	16.69	23.91
Unimportant	274	6.49	7.95
Not at all important	786	18.60	27.51
Cost of Inputs			
Very important	1,289	30.47	22.39
Important	1,486	35.13	31.76
Neither important or unimportant	712	16.83	20.38
Unimportant	205	4.85	5.73
Not at all important	538	12.72	19.73
Expected Commodity Price			
Very important	1,409	33.35	21.02
Important	1,104	26.13	23.18
Neither important or unimportant	779	18.44	24.19
Unimportant	270	6.39	8.45
Not at all important	663	15.69	23.15
Landlord Preferences			
Very important	304	7.26	3.61
Important	541	12.91	8.48
Neither important or unimportant	1,239	29.58	29.76
Unimportant	565	13.49	11.32
Not at all important	1,540	36.76	46.83
Commodity Loan Rates			
Very important	299	7.24	4.93
Important	585	14.17	8.53
Neither important or unimportant	1,189	28.80	31.93
Unimportant	472	11.43	10.79
Not at all important	1,583	38.35	43.82
Counter-Cyclical Payments			
Very important	378	9.06	4.17
Important	585	14.02	8.16
Neither important or unimportant	1,253	30.03	33.16
Unimportant	501	12.01	10.02
Not at all important	1,456	34.89	44.49
Direct (Decoupled) Payments			
Very important	603	14.40	7.87
Important	808	19.30	13.07
Neither important or unimportant	1,105	26.39	29.67
Unimportant	411	9.82	8.69
Not at all important	1,260	30.09	40.70
Crop Insurance			
Very important	492	11.73	6.16
Important	808	19.26	13.40
Neither important or unimportant	1,157	27.58	30.23
Unimportant	481	11.47	11.75
Not at all important	1,257	29.96	38.46
Time Commitments Off-Farm			
Very Important	519	12.38	16.50
Important	871	20.77	22.12
Neither important or unimportant	1,182	28.19	27.12
Unimportant	473	11.28	7.53
Not at all important	1,148	27.38	26.73
Base Acreage Updates			
Very important	364	8.69	6.30
Important	763	18.21	11.15
Neither important or unimportant	1,307	31.19	31.41
Unimportant	445	10.62	10.85
Not at all important	1,311	31.29	40.29

may reflect an inability to separately account for receipts from loan deficiency payments from receipts received from the market—since the receipts are fully fungible across the two sources.

Perhaps, of greatest importance to our objectives here are the questions regarding the importance of counter-cyclical payments and fixed, direct payments. Only 12.3% of the producers note that counter-cyclical payments are important or very important to their acreage decisions.[8] Likewise, about 21% of the growers indicate that direct payments are an important factor in their acreage decisions. In contrast, 49.9% indicate that direct payments are unimportant or not at all important to their acreage allocations. The responses would seem to largely square with the conclusions of Goodwin and Mishra, who found small but statistically significant effects of decoupled payments on production. A majority of growers (50.2%) indicated that crop insurance was not an important factor in their acreage decisions,

[8] It should be noted that farmers' views about the relative importance of loan rates and counter-cyclical payments may depend upon market conditions in the year in which the question is posed. In particular, such program benefits may seem to be much more important when prices are low.

while only 19.6% said that insurance was important. Time commitments off the farm appear to be an important factor in farmers' decisions about acreage. In light of the increasing relevance of off-farm work, this is not surprising. Almost 39% of the growers indicated that such time commitments were important while 34.3% indicated that they were not important.

Finally, farmers were asked about the importance of the base acreage updating provisions of the 2002 Farm Bill. These updating provisions have been a point of substantial debate in that it is often argued that expectations about future updating may influence current production decisions. Our results would tend to lessen such concerns as only 17.5% of the farmers indicated that updating was important or very important while over 51% indicated it was unimportant.

Allocation of Direct Payments

The 2003 ARMS survey also solicited information about farmers' allocations of direct payments across different farm and household uses. There are two groups of farmers—those that received direct payments in 2003 and those that did not. For the latter group, the survey asks how a hypothetical $10,000 direct payment would be allocated. We present weighted averages for the entire sample and then for the subsets of producers. Of course, it is important to emphasize the fungibility of funds within the farm household. Directing a certain percentage of direct payment receipts toward farm operating costs may mean that other funds are reallocated away from operating costs. Thus, actual patterns of adjustment revealed in acreage response models are believed to provide a sounder picture of the potential production effects of direct payments. That said, these results provide a means for examining how farmers perceive their intrahousehold allocations of funds received as direct payments.

Table 3 reports summary statistics (population-weighted means) for the reported allocations of fixed payments. An interesting result is that the typical farm reported that 67.9% of the payments would be allocated to farm uses while only 32.1% would go to household uses. This would seem to suggest that the direct payments would be expected to have important effects on production. The allocation of payments is further decomposed into a number of farm and nonfarm uses. The largest share of payments would go toward farm operating costs—again suggesting evidence that contrasts with earlier results that indicated small effects from decoupled payments. Family (nonfarm), living expenses were the next most important use

Table 3. Stated Uses of Fixed, Direct Payments

Use of Fixed (Decoupled) Direct Payments	Weighted Average	Standard Deviation
Entire Sample ($N = 4,471$)		
Used on farm	67.86	474.01
Used at home	32.14	474.01
Used on farm operating costs	34.02	522.33
Used on farmland rental	2.36	131.75
Used on farm capital expenditures	14.10	372.96
Used to buy farmland	7.19	289.89
Used to pay down farm debt	10.19	335.70
Used on family living expenditures	14.93	343.06
Used to build household cash reserves	6.49	233.74
Used in nonfarm financial assets	3.32	198.11
Used in nonfarm real assets	4.03	194.49
Used to pay down nonfarm debt	3.37	170.46
Sub-Sample That Received Payments in 2003 ($N = 2,525$)		
Used on farm	62.49	557.29
Used at home	37.51	557.29
Used on farm operating costs	26.63	547.83
Used on farmland rental	1.43	110.24
Used on farm capital expenditures	16.47	462.75
Used to buy farmland	8.51	366.16
Used to pay down farm debt	9.46	374.78
Used on family living expenditures	16.59	412.62
Used to build household cash reserves	7.79	293.43
Used in nonfarm financial assets	4.08	255.99
Used in nonfarm real assets	4.92	248.01
Used to pay down nonfarm debt	4.14	220.55

(Continued)

Table 3. ***(Continued)***

Use of Fixed (Decoupled) Direct Payments	Weighted Average	Standard Deviation
Sub-Sample That Did Not Receive Payments in 2003 ($N = 1,946$)		
Used on farm	85.20	270.25
Used at home	14.80	270.25
Used on farm operating costs	57.88	401.52
Used on farmland rental	5.38	151.35
Used on farm capital expenditures	6.46	184.32
Used to buy farmland	2.91	129.23
Used to pay down farm debt	12.56	275.63
Used on family living expenditures	9.57	213.75
Used to build household cash reserves	2.31	107.16
Used in nonfarm financial assets	0.88	66.03
Used in nonfarm real assets	1.15	77.44
Used to pay down nonfarm debt	0.90	53.28

of fixed payments, claiming an average of 14.9%. Farm capital expenditures were also important, with the typical farm reporting 14.1% of fixed payments being used for farm capital expenditures. A substantial percentage (10.19%) of the payments were used to pay down farm debt. A small percentage of the direct payments were used to rent or buy additional farm land. This would seem to be consistent with the findings of earlier research that found the acreage effects of direct payments to be small. However, the finding is also somewhat at odds with farmers' indications that a substantial percentage of their payment receipts were used on farm operating costs. If total land is static and operating costs are changed, this may suggest changes in operating practices—which in turn would seem to imply that production had previously (before direct payments) been constrained at some inefficient level. That is, a direct payment should not have an effect on producers who are operating optimally unless they were constrained from reaching this optimum without the payments. The results are quite similar when the sample is split between those farmers receiving payments and those that did not. A somewhat higher proportion of on-farm usage is implied for those producers that did not actually receive payments in 2003. It is interesting to note that those farms not receiving payments indicated that a higher proportion of direct payment receipts (85.2%) would be directed toward farm uses than those farms that did not receive payments (who indicated that 62.5% would be used on the farm).

We also considered an analysis of the factors underlying farmers' reported allocations of direct payment funds. We considered a model relating the percentage (ranging from 0 to 100%) of total direct payments allocated on the farm. In that a substantial proportion of farm operators reported either no usage on the farm or 100% usage on the farm, our dependent variable is doubly censored—from below at 0 and from above at 100. Thus, we utilize a Tobit model with double censoring. We relate a number of conceptually relevant operator and farm characteristics to the proportion of direct payments that growers indicate they used on the farm. Parameter estimates and summary statistics are reported in table 4. Note that marginal effects can be gleaned from the estimates by scaling the parameters by the proportion of noncensored observations (0.3126).

The results indicate that operators of larger farms are more likely to report significant on-farm usage of the funds received as direct payments. Operators who are highly leveraged are much more likely to allocate funds toward on-farm uses. This is consistent with the argument that direct payments may affect production through their effect on credit-constrained

Table 4. Estimates of Tobit Model: Determinants of On-Farm Usage of Decoupled Payments

Variable	Parameter Estimate	Standard Error
Intercept	119.6807	7.8944*
Farm size	0.6761	0.2771*
Debts/assets	90.8359	8.8332*
Crop Sales	−4.3927	2.8709
Age	−0.4110	0.0930*
Insurance	−64.0218	16.5743*
Sole proprietor	−14.5141	4.5445*
Retiring	−12.4044	3.0412*
Off-farm work	−0.2446	0.0516*
Total household income	0.1840	0.1434
Household net wealth	0.7970	0.2851*
σ	61.7418	1.2885*
Proportion noncensored	0.3126	

Note: An asterisk indicates statistical significance at the $\alpha = 0.10$ or smaller level.

producers. Surprisingly, the proportion of total sales accounted for by crops is not related to the allocation of fixed payments. Older farmers and farmers expecting to retire in the near future are much less likely to allocate direct payment receipts to on-farm uses. Wealthy farm operators are more likely to use direct payment receipts for on-farm purposes while highly risk-averse operators (as indicated by the share of total costs represented by insurance purchases) are less likely to allocate direct payments to the farm. These results may be consistent with arguments that wealth increases may result in risk-averse agents assuming more risk by expanding their farm operation.

Overall, these results may have implications for the nonneutrality of direct payments. Farm operators report that a substantial proportion of direct payments are directed toward farm-operating costs and other on-farm uses. However, many questions remain and, in some cases, the results reflect inconsistencies that merit further investigation to resolve. These results are also subject to caveats regarding the fungibility of funds across alternative uses.

Acreage Response Models

The third segment of our analysis examines the acreage decisions of a cross-section of Corn Belt farmers observed in 2002 and 2003. This period is characterized by the new policy environment provided by the 2002 FSRIA legislation. In addition, as we have noted above, the 2002 and 2003 surveys collected information about farms' acreage base during the FAIR Act period (1996–2001) and during the current legislation. Goodwin and Mishra hypothesized that a correlation between historical production patterns, base acreages, and direct (AMTA) payments may have induced a positive bias in their analysis of the production effects of direct payments.[9] In this analysis, we are able to condition the effects of direct payments on base acreages under the 1996 FAIR Act. This acreage base was largely determined on the basis of historical production during the 1980s. For the first time in many years, the updating provisions of the 2002 Act allowed growers to change their base acreage and yields on the basis of production during the 1998–2001 period.[10] It should be noted that, to the extent that historical base is correlated with current (2003) direct payments, it may be difficult to separate their effects in an econometric model. Thus, it is important to examine both base acreage and direct payment effects.[11]

Parameter estimates and summary statistics are presented in table 5. Note that a majority (72.3%) of the growers did not produce wheat and thus the parameters for the wheat acreage response model should be scaled by the proportion of noncensored observations (0.273) when considering marginal effects. The price effects for corn are statistically insignificant while the soybean results exhibit a positive effect. Note that the inclusion of fixed year effects may make precise identification of price effects difficult since the aggregate year-to-year variation in prices is captured by the fixed effects. The direct payments do not exhibit a statistically significant influence on corn, wheat, or soybean acreage in any case. The results suggest that higher fertilizer prices may be correlated with a shift in acreage away from corn toward soybeans and wheat.

The 1996 base acreage parameter is statistically significant with a positive effect in the corn equation. However, the effect is small with each additional base acre suggesting an increase of about 0.15 corn acres in 2003. As we have noted, it may be difficult to separate the effects of direct payments and historical base acreage. If anything, we would expect the inclusion of the historical base to push the payment effect toward zero. Thus, the results may be consistent with a very modest positive relationship between direct payments and corn production. However, any such relationship is small.[12]

In short, our analysis of direct payments on the acreage decisions of Corn Belt producers produces results very similar to those presented by Goodwin and Mishra. The evidence is fairly robust in concluding that direct payments do not appear to trigger significant

[9] Direct payments under the FAIR Act are often referred to as AMTA payments due to their association with Title I of the 1996 legislation, which was called the Agricultural Market Transition Act. The payments under the 1996 Act functioned in a manner that is identical to what is now more properly termed "fixed, direct" payments.

[10] To be more precise, producers could update program yields for counter-cyclical payments but not for direct payments.

[11] It is also important to point out that we implicitly assume that base acreage and direct payments are exogenous to the individual producer. This is justified by the fact that these program parameters are exogenously determined by Congress. However, it should also be noted that farmers have the option of not participating in programs and thus it is possible that payment receipts and other program parameters reflect such participation decisions.

[12] Our base acreage measures are given by the sum of total corn and wheat base. We also considered the total of all base acres and obtained similar results and identical conclusions.

Table 5. Parameter Estimates and Summary Statistics: Farm-Level Acreage (A_{it}) Equations

Variable	Corn	Soybeans	Wheat
Intercept	−534.0547	−1,320.5700	−1,514.9400
	(502.4445)	(398.9210)*	(781.5141)*
Corn price	−8.0044	−13.5686	−94.3720
	(87.5897)	(77.0031)	(116.3309)
Soybean price	50.3624	128.5502	51.7905
	(94.3692)	(73.2909)*	(111.4818)
Wheat price	49.0250	59.5035	91.5247
	(51.7695)	(43.6533)	(73.3578)
Farm size	0.3434	0.3972	0.0364
	(0.0489)*	(0.0311)*	(0.0269)
Average ad hoc payments	7.7234	−0.8236	3.7743
	(4.4829)*	(3.1044)	(4.4971)
Direct payments	1.7261	1.5010	2.4833
	(1.7816)	(1.3074)	(2.2341)
Direct payments ∗ debts/assets	2.9924	0.8001	−0.8381
	(2.2943)	(1.7620)	(4.3704)
Direct payments ∗ insurance	−18.5580	−14.6591	−43.1650
	(33.3527)	(26.0393)	(36.8213)
Wealth	1.2039	−0.1828	0.5959
	(1.6833)	(1.1899)	(2.0056)
Livestock	−80.8849	−116.2960	−18.0758
	(14.9652)*	(13.3092)*	(16.4647)
Debts/assets	0.5068	−13.9683	−8.2757
	(22.0411)	(23.1194)	(57.8969)
Insurance	11.0689	146.5916	−40.1039
	(261.6926)	(232.3479)	(229.8656)
D_{02}	6.0758	86.7698	199.9056
	(44.8059)	(37.5342)*	(87.2598)*
Base acreage under FAIR	0.1435	0.0558	0.0040
	(0.0724)*	(0.0497)	(0.0826)
Fuel price	202.5615	85.6140	−30.6578
	(127.3888)	(105.8002)	(192.5841)
Fertilizer price	−538.9053	1,123.0500	3,506.2900
	(678.2270)	(473.4652)*	(999.7553)*
Wage	−5.2709	12.7971	39.6725
	(20.7895)	(16.8517)	(26.4335)
δ_i	44.4555	12.9024	−46.4043
	(38.7187)	(18.8004)	(22.9937)*
R^2	0.8006	0.8671	0.2996

Note: Numbers in parentheses are standard errors. An asterisk indicates statistical significance at the $\alpha = 0.10$ or smaller level. Note that δ_i is the correction term derived from the Shonkwiler and Yen procedures for censored equations.

acreage adjustments among these Corn Belt farms. In contrast to the work of Goodwin and Mishra, we are able to condition on historical production (base acreage). When base acreage is added to the equations, the direct payments do not exhibit a statistically significant effect on acreage allocations.

Concluding Comments

This analysis has evaluated the implied production neutrality of fixed, direct payments. These decoupled payments have played an important role in recent U.S. farm policy. Under the current farm legislation, farmers receive direct payments on all program crops, including peanuts and soybeans, which were added in 2002. These payments are based upon an acreage base that was determined either in the 1980s or, for farmers that chose to update their base, in the 1998–2001 period. The extent to which these payments are actually decoupled from production decisions has been the topic of considerable controversy in recent international trade negotiations.

Previous research by Goodwin and Mishra found that these payments had very small, though statistically significant effects on acreage decisions. In this analysis, we consider an expanded version of this earlier research. In particular, we utilize new survey data that allows us to condition recent acreage allocations on farms' historical base acreages. We also consider an evaluation of survey questions that elicited information about the factors that influence farm operators' acreage decisions as well as their allocation of fixed payment receipts among farm and nonfarm uses. The results largely confirm the findings of earlier research in that they generally suggest that any effects of direct payments on acreage are likely to be modest. However, inconsistencies in the survey responses arise in some cases. In particular, farmers report that the largest share of direct payment receipts tend to be used to cover agricultural production costs. At the same time, the results provide little evidence that producers are using direct payments to expand production by renting or buying additional land. These results, taken together, may suggest that farmers who previously were unable to adjust production due to credit constraints are able to move to more optimal means of production after receiving the payments.

The extent to which this actually occurs is unclear, though there is some reason to question such effects in light of the fungibility of dollars from alternative sources on the farm. An analysis of factors related to farmers' reported allocations of direct payments to on-farm uses suggests that operators who are highly leveraged are more likely to use direct payments on the farm. Again, this may confirm suspicions that credit constraints underlie the potential for decoupled payments to have production effects. We also find that farm operators who appear to be highly risk averse are less likely to allocate direct payments to on-farm uses while wealthier operators are more likely to use such payments on the farm. These results are consistent with arguments regarding the potential for direct wealth transfers to alter agents' risk preferences.

When agents are queried about the factors that underlie their acreage decisions, direct payments, counter-cyclical payments, and the potential for base acreage, updates are all implied to be relatively minor factors. Input costs, commodity prices, and crop rotation requirements are implied to be much more important determinants of acreage decisions.

Finally, an evaluation of acreage decisions within a sample of Corn Belt farms finds no statistically significant relationship between direct payments and acreage decisions for corn, wheat, and soybeans. In contrast to existing work, we are able to condition current production on the acreage base that was largely established during the 1980s. These results are consistent with earlier findings that have suggested that direct payments have modest effects on acreage decisions.

This analysis offers additional evidence regarding the potential for direct payments to have production and acreage effects. However, many questions remain open to inquiry. Farmers' indications that they direct much of these payments to on-farm operating costs while, at the same time, not expanding acreage, is somewhat puzzling. Additional research is needed to evaluate these relationships in greater detail. Likewise, we have presented a broad evaluation of the factors that farmers reveal to underlie their acreage decisions. These factors need to be examined more fully to determine what underlies the differences across producers. These issues are the focus of current research efforts.

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